

1 WHAT IS CLAIMED IS:

- 2 1. A catalyst having a macropore structure comprising mordenite zeolite
3 having a silica to alumina molar ratio in the range of about 50:1 to about
4 105:1 and wherein the peak macropore diameter of the catalyst,
5 measured by ASTM Test No. D 4284-03, is less than about
6 900 angstroms and the cumulative pore volume of the catalyst at pore
7 diameters less than or equal to about 500 angstroms, measured by
8 ASTM Test No. D 4284-03, is less than or equal to about 0.30 milliliters
9 per gram.
10
- 11 2. The catalyst of claim 1 wherein the cumulative pore volume at pore
12 diameters less than or equal to about 400 angstroms is less than or
13 equal to about 0.30 milliliters per gram.
14
- 15 3. The catalyst of claim 2 wherein the cumulative pore volume at pore
16 diameters less than or equal to about 300 angstroms is less than or
17 equal to about 0.25 milliliters per gram.
18
- 19 4. The catalyst of claim 3 wherein the cumulative pore volume at pore
20 diameters less than or equal to about 300 angstroms is less than to
21 equal to about 0.20 milliliters per gram.
22
- 23 5. The catalyst of claim 4 wherein the cumulative pore volume of the
24 catalyst at pore diameters less than or equal to about 400 angstroms is
25 in the range of about 0.05 milliliters per gram to about 0.18 milliliters per
26 gram.
27
- 28 6. The catalyst of claim 5 wherein the cumulative pore volume of the
29 catalyst at pore diameters less than or equal to about 300 angstroms is
30 in the range of about 0.08 milliliters per gram to about 0.16 milliliters per
31 gram.

- 1 7. The catalyst of claim 1 wherein the peak macropore diameter is in the
2 range of about 400 angstroms to about 800 angstroms.
3
- 4 8. The catalyst of claim 7 wherein the peak macropore diameter is in the
5 range of about 400 angstroms to about 700 angstroms.
6
- 7 9. The catalyst of claim 8 wherein the peak macropore diameter of the
8 catalyst is in the range of about 450 angstroms to about 600 angstroms.
9
- 10 10. The catalyst of claim 1 wherein the mordenite zeolite has a silica to
11 alumina molar ratio of about 65:1 to about 95:1.
12
- 13 11. The catalyst of claim 10 wherein the mordenite zeolite has a silica to
14 alumina molar ratio of about 75:1 to about 90:1.
15
- 16 12. The catalyst of claim 1 wherein the catalyst is in the form of a tablet.
17
- 18 13. A catalyst composite comprising:
19
- 20 (a) the catalyst of claim 1; and
21
- 22 (b) a binder.
23
- 24 14. The catalyst composite of claim 13 wherein the binder is a suitable
25 inorganic material.
- 26 15. The catalyst composite of claim 14 wherein the binder is alumina.
- 27 16. The catalyst composite of claim 13 wherein the mordenite zeolite is
28 present in the range of about 50 weight percent to about 99 weight
29 percent based on the total dry weight of the catalyst composite.

- 1 17. The catalyst composite of claim 16 wherein the mordenite zeolite is
2 present in the range of about 60 weight percent to about 90 weight
3 percent based on the total dry weight of the catalyst composite.
- 4 18. A catalyst composite prepared by the process of claim 13.
- 5 19. A process for preparing a catalyst composite comprising:
- 6 (a) contacting a mordenite zeolite having a silica to alumina molar ratio
7 in the range of about 50:1 to about 105:1 with a binder in the
8 presence of volatiles to form a mixture wherein the weight percent
9 of mordenite zeolite is in the range of about 50 to about 99 based
10 on the total dry weight of the resulting catalyst composite, and
11 wherein the volatiles in the mixture are in the range of about
12 30 weight percent to about 70 weight percent of the mixture;
- 13 (b) shaping the mixture to form a composite;
- 14 (c) drying the composite; and
- 15 (d) calcining the composite in a substantially dry environment.
- 16 20. The process of claim 19 wherein in step (b) shaping comprises
17 extruding.
- 18 21. The process of claim 19 wherein in step (a) the weight percent of
19 mordenite zeolite is in the range of about 60 to about 90 based on the
20 total weight of the mixture.
- 21 22. The process of claim 19 wherein the binder in step (a) is a suitable
22 inorganic material.
- 23 23. The process of claim 22 wherein the binder is alumina.

- 1 24. The process of claim 19 wherein in step (a) the volatiles in the mixture
2 are present in the range of about 35 weight percent to about 50 weight
3 percent of the mixture.
- 4 25. The process of claim 24 wherein the volatiles comprise water and an
5 acid.
- 6 26. A catalyst composite prepared by the process of claim 19.
7
- 8 27. A process for producing an alkylated aromatic composition comprising
9 contacting at least one aromatic hydrocarbon with at least one olefin
10 under alkylation conditions in the presence of the catalyst composite of
11 claim 13.
12
- 13 28. The process of claim 27 further comprising a step wherein the catalyst
14 composite is reactivated with an aromatic hydrocarbon flush.
15
- 16 29. The process step of claim 28 wherein the catalyst composite is
17 reactivated with a benzene flush.
18
- 19 30. A process for preparing an alkylated aromatic composition comprising:
20 contacting at least one aromatic hydrocarbon with at least one olefin
21 under alkylation conditions in the presence of a catalyst having a
22 macropore structure comprising mordenite zeolite having a silica to
23 alumina molar ratio in the range of about 50:1 to about 105:1 wherein
24 the peak macropore diameter, measured by ASTM Test No. D 4284-03,
25 is less than about 900 angstroms and the cumulative pore volume of the
26 catalyst at pore diameters less than or equal to about 500 angstroms,
27 measured by ASTM Test No. D 4284-03, is less than or equal to about
28 0.30 milliliters per gram.
29

- 1 31. The process of claim 30 further comprising a step wherein the catalyst
2 composite is reactivated with an aromatic hydrocarbon flush.
3
- 4 32. The process step of claim 31 wherein the catalyst composite is
5 reactivated with a benzene flush.
- 6 33. The process of claim 30 wherein the aromatic hydrocarbon is benzene
7 or toluene.
- 8 34. The process of claim 33 wherein the olefin is an alpha olefin, an
9 isomerized olefin, a branched-chain olefin or mixtures thereof.
10
- 11 35. The process of claim 34 wherein the olefin has from about 4 carbon
12 atoms to about 80 carbon atoms.
- 13 36. The process of claim 34 wherein the alpha olefin or the isomerized olefin
14 has from about 6 carbon atoms to about 60 carbon atoms.
15
- 16 37. The process of claim 36 wherein alpha olefin or the isomerized olefin
17 has from about 20 carbon atoms to about 40 carbon atoms.
18
- 19 38. The process of claim 34 wherein the branched-chain olefin has from
20 about 6 carbon atoms to about 70 carbon atoms.
21
- 22 39. The process of claim 38 wherein the branched-chain olefin has from
23 about 8 carbon atoms to about 50 carbon atoms.
24
- 25 40. The process of claim 39 wherein the branched-chain olefin has from
26 about 12 carbon atoms to about 18 carbon atoms.
27

- 1 41. The process of claim 34 wherein the olefin is a partially-branched-chain
2 isomerized olefin wherein the olefin has from about 6 carbon atoms to
3 about 40 carbon atoms.
4
- 5 42. The process of claim 41 wherein the partially-branched-chain isomerized
6 olefin has from about 20 carbon atoms to about 40 carbon atoms.
7
- 8 43. The process of claim 27 further characterized by an increase of at least
9 50 hours in the alkylation run length time compared to mordenite
10 catalysts having a peak macropore diameter greater than 900 angstroms
11 and a cumulative pore volume at pore diameters less than or equal to
12 300 angstroms is greater than 0.30 milliliters per gram.
- 13 44. The process of claim 43 wherein the increase in the alkylation run length
14 time compared to mordenite catalysts having a silica to alumina molar
15 ratio less than 50:1 and greater than 105:1 and having a peak
16 macropore diameter greater than 900 angstroms and a cumulative pore
17 volume at pore diameters less than or equal to 300 angstroms greater
18 than 0.3 milliliters per gram is at least 75 hours.
- 19 45. The process of claim 44 wherein the increase in the alkylation run length
20 time compared to mordenite catalysts having a silica to alumina molar
21 ratio less than 50:1 and greater than 105:1 and having a peak
22 macropore diameter greater than 900 angstroms and a cumulative pore
23 volume at pore diameters less than or equal to 300 angstroms greater
24 than 0.3 milliliters per gram is at least 100 hours.
25
- 26 46. The process of claim 30 further characterized by an increase of at least
27 50 hours in the alkylation run length time compared to mordenite
28 catalysts having a silica to alumina molar ratio less than 50:1 and
29 greater than 105:1 and having a peak macropore diameter greater than

1 900 angstroms and a cumulative pore volume at pore diameters less
2 than or equal to 300 angstroms greater than 0.3 milliliters per gram.

3

4 47. The process of claim 46 wherein the increase in the alkylation run length
5 time compared to mordenite catalysts having a silica to alumina molar
6 ratio less than 50:1 and greater than 105:1 and having a peak
7 macropore diameter greater than 900 angstroms and a cumulative pore
8 volume at pore diameters less than or equal to 300 angstroms greater
9 than 0.3 milliliters per gram is at least 75 hours.

10 48. The process of claim 47 wherein the increase in the alkylation run length
11 time compared to mordenite catalysts having a silica to alumina molar
12 ratio less than 50:1 and greater than 105:1 and having a peak
13 macropore diameter greater than 900 angstroms and a cumulative pore
14 volume at pore diameters less than or equal to 300 angstroms greater
15 than 0.3 milliliters per gram is at least 100 hours.